

# QUEST

ADVENTURES IN THE WORLD OF SCIENCE

## CONSTRUCTIONS II

46

**FACT FILES ON:**

- ▶ *Launch pads*
- ▶ *Giant cranes*
- ▶ *Demolition technology*
- ▶ *Intelligent homes and offices*
- ▶ *Nature's homebuilders*
- ▶ *Building sites*
- ▶ *Roadlaying machines*

**MAKE A GANTRY CRANE****THREE PROJECTS****GIANT POSTER**  
**THE GREAT PYRAMIDS OF EGYPT**

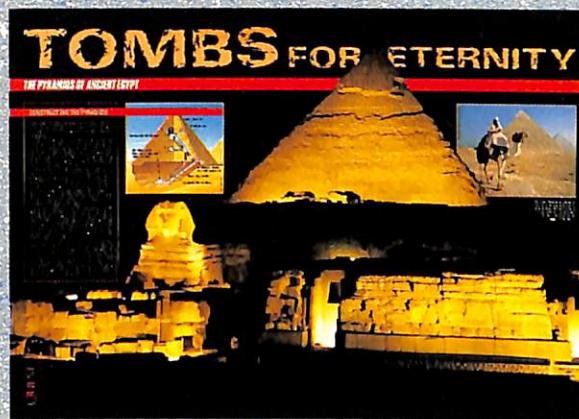
# INSIDE THIS PACK

## FACT FILES

- Web spinners and cocoon builders
- The demolition industry
- Rocket launch gantry
- Cranes
- Computerizing the home
- Building from the ground up
- Planning and making roads



MODEL Gantry crane

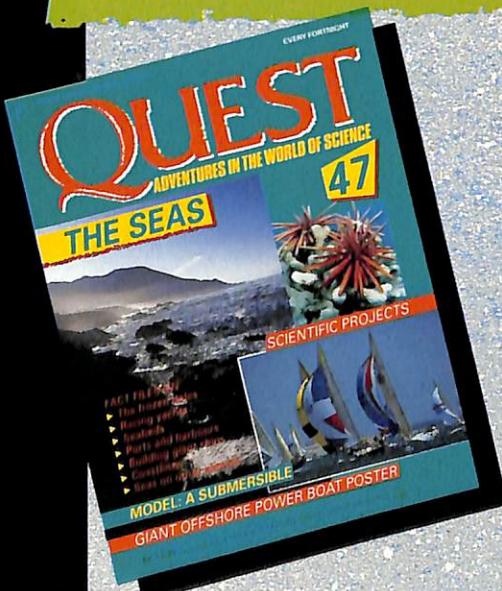


POSTER  
Tombs for eternity



THREE  
EXPERIMENTS

## COMING IN QUEST 47 THE SEAS



MODEL  
Deep sea  
submersible

## FACT FILES INCLUDE:

- Seas of ice
- Racing yachts
- Ports and harbours
- Seas on other planets
- Shipbuilding
- Seabeds
- Coastlines



POSTER  
Offshore power boats

ISSN 1350-3766



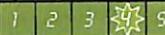


# PROJECTS

## CONSTRUCTIONS II

Test the strength of different structures with this simple construction kit.

### SUPER STRUCTURE



Make your own high-rise structure – or even a bridge – with a framework of cocktail sticks and plasticine.

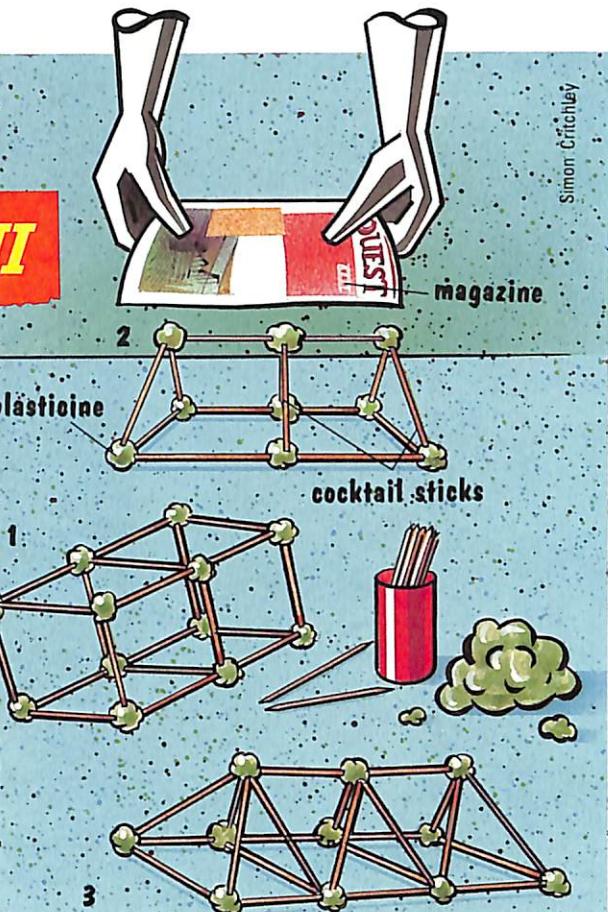
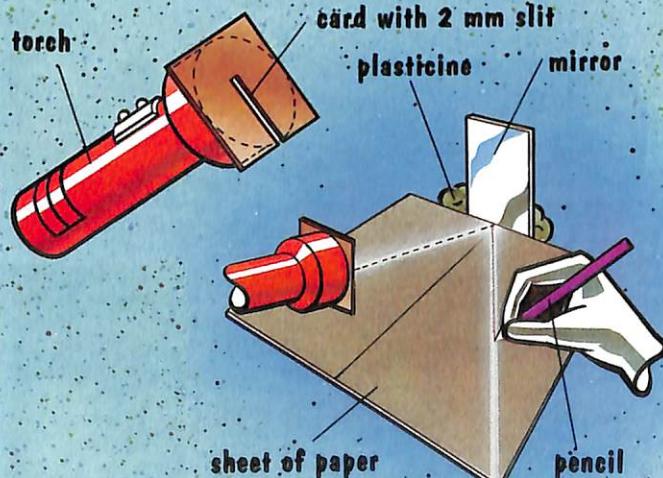
You need a pack of cocktail sticks, plasticine (or blu-tack) and some magazines. Use the cocktail sticks in the same way as girders and beams are used on a construction site – gradually build a triangular framework by joining the cocktail sticks together with plasticine. First make one using 12 pieces of plasticine and 20 cocktail sticks. Then build one with 9 pieces of plasticine and 15 cocktail sticks, and a third one with 11 pieces of plasticine and 24 cocktail sticks. Test which framework is the strongest by placing the magazines, one at a time, on top of each frame, in turn, until it collapses. You will find that the first is the strongest and the third is the weakest. Can you see why?

### ADVENTURES IN THE WORLD OF SCIENCE

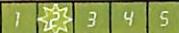
### REFLECTING RAYS



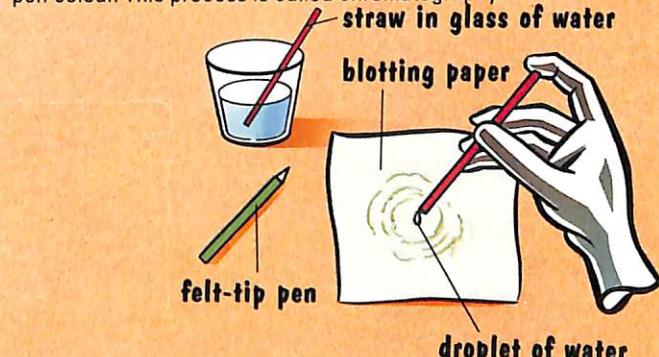
You need a torch, a protractor, a mirror, a piece of plasticine, a sheet of paper, a pencil and a small piece of card. First cut a slit, 2 mm wide, in the card as shown and tape it to the front of the torch. Next draw a line across the middle of the paper. In the right hand half, use the protractor to help you draw a line at 45° to the centre line. Stand the mirror vertically, with the help of the plasticine, at the centre line. Turn out the lights, switch on the torch and aim the single ray vertically along the 45° line. This ray will be reflected by the mirror along the paper. Trace this reflection with the pencil. Turn on the lights and measure the angle of the second line. It should be 45°. You can try this again using other angles and see if the same holds true.



### COLOUR TEST



You need a sheet of blotting paper, different coloured felt-tip pens (non-permanent), a straw and a glass of water. Take the blotting paper and mark the centre with one of the pens. Suck some water into the straw and keep it there by putting your thumb over the end. Position the straw over the ink spot and take off your thumb to release a drop of water. Repeat two or three times, allowing each drop to dry before adding the next. You will find that rings of different colours gradually separate out of the spot. These are the different dyes that make up the pen colour. This process is called chromatography.



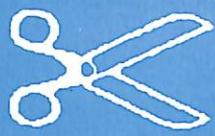
### PROJECT INFORMATION



Each QUEST project and model has its own difficulty rating:  
1 very simple, 2 simple,  
3 intermediate, 4 advanced,  
5 complicated.

### WARNING!

Every care has been taken to ensure projects are as safe as possible. However, parents should supervise all projects. The publisher can accept no liability for injury.



# MODEL

## ASSEMBLY INSTRUCTIONS

1 2 3 4 5

### You will need

Scissors • Ruler • Craft knife • Glue

Before cutting out the pieces, score along all broken lines with a blunt edge and ruler to make folding and gluing easier. Study the ASSEMBLY DIAGRAM to see how the pieces fit together, and use the dotted lines as a guide for positioning.

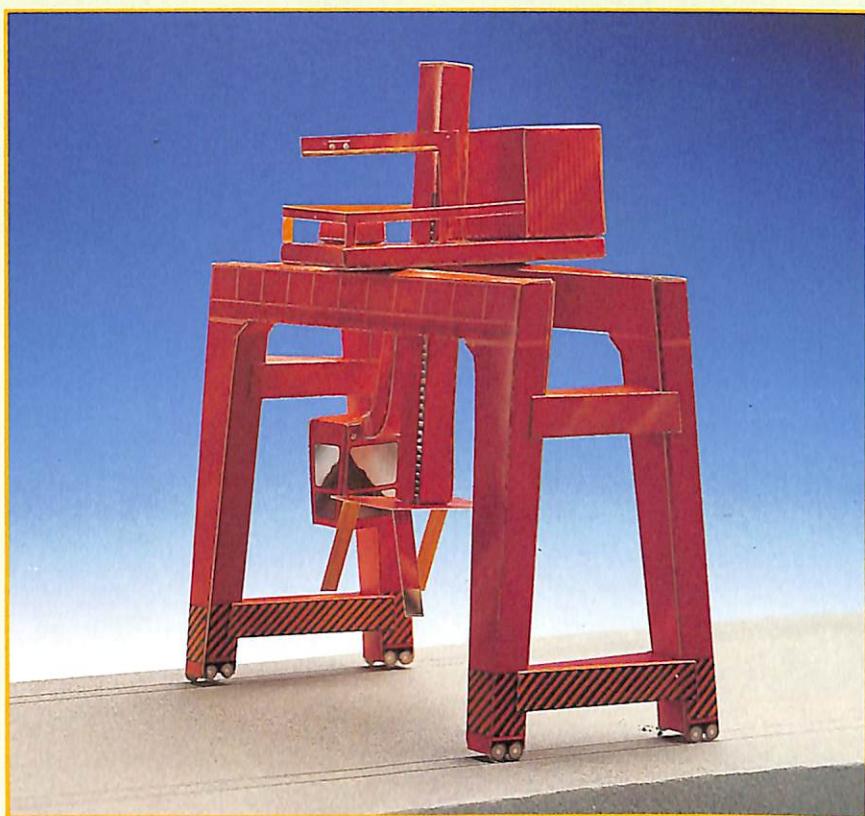
**NB** Younger children will need supervision when using a craft knife.

### To make up

#### Gantry of crane

1 Cut out frame **A**, cutting the slit along which the machinery will travel. Fold into shape, gluing corners. Cut out **B**, fold and glue to **A**. Cut out leg sections **C** and **D** and glue to inner side. Repeat with **E**, **F**, **G**, **H**.

2 Cut out **I** and **J** and glue into shape. Glue **I** between the two frame sections, following positioning dots (see ASSEMBLY DIAGRAM). Repeat with **J**.



3 Cut out **K** and **L** and fold to shape. Spread glue on tabs and stick in position on **A** and **E**, following positioning marks.

#### Platform of crane

1 Cut out base of platform **M** and holes in middle for lift to fit in later. Cut out operating boxes **N**, **O**, and **P**, glue into shape, then glue on to **M**.

2 Cut out **Q** and glue to **M**. Cut out rail **R** fold down tabs and glue around **M**.

3 Cut out **S** and **T** and glue to the underside of **M**. These form the runners beneath the platform.

#### Lift and cabin

1 Cut out lift shaft **U** and glue into shape. Cut out **V** and stick to top end.

2 Cut out cabin attachment parts **W**, **X**, **Y** and **Z**. Fold down the tabs on **W** and **X**. Then stick **Y** on to the tabs along the shorter sides of **W** and **X** (see ASSEMBLY DIAGRAM). Repeat this with **Z**, sticking **Z** along other side of **W** and **X**.

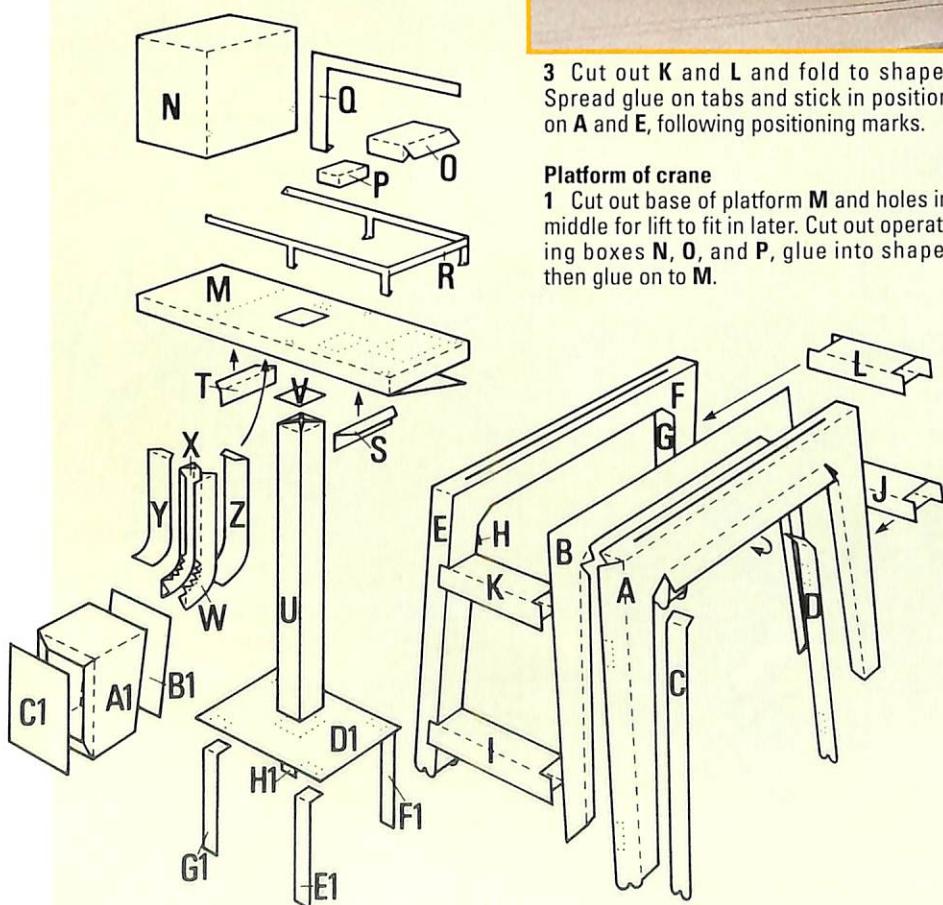
3 To make cabin, cut out **A1**, **B1** and **C1**. Glue **A1** into shape, sticking **B1** and **C1** on to tabs on open sides. Glue curved end of **W/X/Y/Z**, on to cabin top at **B1**, following positioning marks, and glue other end to underside of platform **M**.

4 To make lift base, cut out **D1**, **E1**, **F1**, **G1** and **H1**. Spread glue on upper side of tabs on legs **E1**, **F1**, **G1** and **H1** and stick to underside of base **D1**, one at each corner. Then glue **D1** to bottom end of **U** to complete lift.

#### To finish

1 Place runners **S** and **T** into slots in **A** and **E** so that platform can run along gantry as with an operating crane.

2 Push **U** into hole in centre of **M** so that the lift is in position.



## THE PYRAMIDS OF ANCIENT EGYPT

### CONSTRUCTING THE PYRAMIDS

Built about five thousand years ago in Egypt, the pyramids are vast geometrical forms constructed with incredible accuracy and without the help of modern technology.

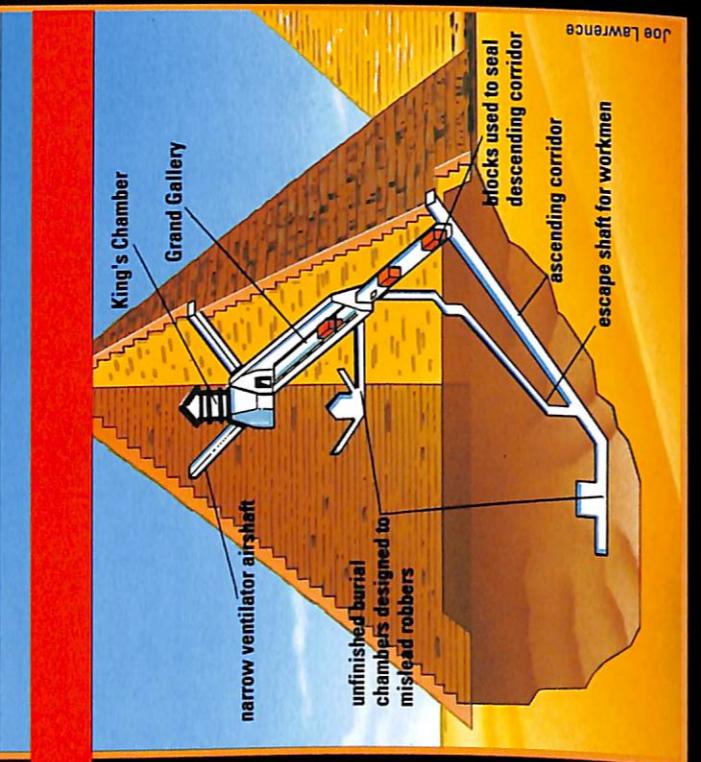
Little is known about the construction techniques which were used but it is likely that surveying was carried out using a system of knotted ropes. To level off the ground before building, a temporary wall round the site could have been filled with water and, using the flat surface of the water as a guide, the land then cut to an equal depth beneath it.

Thousands of men would have been employed on the site of the pyramid. Since the Egyptians had no knowledge of the principle of the pulley, and there is no evidence that they knew about other methods of lifting, labourers would have hauled the blocks of stone up a series of sloping ramps built at angles running up to the pyramid. These would have been raised and lengthened as the pyramid grew in height in order to maintain the angle of the slope.

To protect a pharaoh and the treasures entombed with him in his pyramid for use in the after-life, various security measures were taken. Particulars sealed by plug-blocks – rectangular blocks of stone – were one such precaution. The blocks of stone were let down into the entrance passage of the pyramid until they wedged themselves into a section which had been slightly reduced in width.

Elaborate systems of false and concealed passages were employed to confuse grave robbers. A corridor could appear to finish in a dead end while the entrance to the tomb remained hidden by a sliding trap door in the roof. To protect the tomb, its builders even went as far as packing sand and stones into a vertical shaft above its entrance. As soon as stones at the entrance were moved, supporting blocks released the rubble on to unsuspecting intruders.

Tony Stone Photo Library, London



# ENTER THE WORLD



Tony Stone Photo Library, London

The Great Pyramid of Cheops at Giza, in Egypt, originally stood a monumental 146 metres high. It is, along with the two pyramids beside it, one of the Seven Wonders of the World.

